

DUBAI ACCREDITATION DEPARTMENT

REPORT ON PTP 196TH INTER-LABORATORY PROFICIENCY TESTING PROGRAM DETERMINATION OF FLAKINESS & ELONGATION INDEX IN COARSE CRUSHED ROCK

Date: 14 September 2010

1. INTRODUCTION

This document presents the results of the 196th inter-laboratory proficiency-testing program conducted during the month of August involving the determination of **Flakiness and Elongation Index in Coarse Crushed Rock in Aggregate** with thirty two laboratories participating.

This program is part of the Inter-laboratory Comparison Programs organized by Dubai Accreditation Department (DAC) of Dubai Municipality (DM) for monitoring the validity of test results of laboratories operating in Dubai as a requirement of the Local Order 52/1990 and ISO/IEC 17011: 2004.

2. EXPERIMENTAL DESIGN

2.1 Homogeneity:

DAC had ensured the homogeneity of the samples prior to their distribution to the participating laboratories by conducting homogeneity test on six samples (randomly selected), two portions A & B from each sample were tested. Based on the test results the homogeneity is statistically evaluated as per *ISO 13528:2005 as explained in DAC-G3-03*.

2.2 Participants:

A total of thirty two laboratories participated in this program. Thirty are private laboratories and two are governmental laboratories one of them is accredited by DAC and sixteen are private laboratories operating in the emirate of Dubai which are registered and/or accredited by DAC for construction materials testing, in addition, five participants are from other emirates, six participants are from Qatar; Oman and Bahrain.

2.3 Samples Tested:

One (1) Aggregate sample of approximately 2 kg consists of coarse crushed rock specimen has been distributed to all participating laboratories. With each participant being given one sample with a unique identification number provided during the time of collection.

3. CONFIDENTIALITY

Each laboratory is given a code number to maintain confidentiality of results and to protect their identities. Only the concerned laboratory knows its code number.

4. TEST METHOD

Instructions were given to the participants to test the samples for Determination of flakiness and elongation index in coarse crushed rock *as per (BS 812: 1989 P105 S105.1, BS 812: 1990 P105 S105.2)*.

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5. TEST RESULTS

The test results submitted by the participating laboratories are presented in Appendix A. In order to protect the identity of the participating laboratories, each one was assigned a code number. The numbers in the column headings, Lab #, of the tables represents the code numbers for the participating laboratories.

6. EVALUATION OF RESULTS

6.1 Method of Analysis

The analysis of the participant's results is based on *ISO 13528:2005 (Statistical Methods for the Use in Proficiency Testing by Inter-laboratory Comparisons)*.

6.2 Calculations of Z- scores

Appendix B gives the details of the calculation of the laboratories results and their Z-Scores which are obtained from the raw data. Also Z- Score and participant's results are represented in a bar chart and X-Y scattered plots C. The Z-Score analysis is based on an international Standard (*ISO 13528:2005*).

6.3 Outlier Results

Test	Labs outside the z-scores ± 3
Elongation Index	Lab EX9; Lab EX10; Lab EX16 and Lab EX20
Flakiness Index	Lab EX19

After evaluating the Z-Score, the test results provided by the above mentioned laboratories are outside the Z – score limits ± 3 , the above mentioned laboratories are requested to investigate the root cause of the outlier results, implement a corrective action and a report shall be available for reviewing/checking by the assessment team during the nearest assessment visit.

Also other participating laboratories have showed Z-score values higher than **two** which representing **not outlier** but a warning limit, these laboratories are advised to investigate the potential root cause of such results.

7. APPENDICES

7.1 Appendix A: Raw Data

7.2 Appendix B: Calculation of z-scores and other statistics

7.3 Appendix C: Charts

---- End of Report ----

Flakiness and Elongation Index in Coarse Crushed Rocks

Appendix A: Raw Data

Lab Code #	Lab Results	
	Eelongation Index	Flakiness Index
Lab G01	17.00	31.00
Lab EX20	11.80	26.60
Lab 3	18.00	27.00
Lab 39	17.00	28.00
Lab 4	18.00	27.00
Lab EX9	23.00	24.00
Lab 56	18.00	27.00
Lab 21	17.00	27.00
Lab 7	17.00	27.00
Lab EX5	18.00	27.00
Lab 9	18.00	27.00
Lab 28	16.00	29.00
Lab 23	17.00	28.00
Lab EX6	18.00	28.00
Lab EX16	11.60	26.50
Lab 58	16.00	27.00
Lab EX14	16.00	27.00
Lab 72	17.00	27.00
Lab 74	17.00	29.00
Lab 76	18.00	27.00
Lab 79	16.00	29.00
Lab EX7	16.00	25.00
Lab 82	16.00	29.00
Lab EX10	29.00	27.00
Lab 89	15.00	30.00
Lab EX1	19.00	28.00
Lab EX3	14.00	30.00
Lab EX4	14.00	29.00
Lab EX11	17.00	27.00
Lab EX19	16.60	19.90
Lab EX18	15.00	28.00
Lab EX17	15.00	30.00

Elongation Index

Iteration	0		1		2		3		4		5		6		Z Score
$\delta = 1.5 s^*$	---	xi-x*	2.22	(xi-x*) ²	2.31	(xi-x*) ²	2.27	(xi-x*) ²	2.26	(xi-x*) ²	2.26	(xi-x*) ²	2.26	(xi-x*) ²	Z Score
$x^* - \delta$	---		14.78		14.45		14.47		14.48		14.48		14.48		
$x^* + \delta$	---		19.22		19.06		19.02		19.01		19.00		19.00		
Lab EX16	11.60	5.40	14.78	3.92	14.78	3.88	14.78	3.87	14.78	3.86	14.78	3.86	14.78	3.86	-3.41
Lab EX20	11.80	5.20	14.78	3.92	14.78	3.88	14.78	3.87	14.78	3.86	14.78	3.86	14.78	3.86	-3.28
Lab EX3	14.00	3.00	14.78	3.92	14.78	3.88	14.78	3.87	14.78	3.86	14.78	3.86	14.78	3.86	-1.82
Lab EX4	14.00	3.00	14.78	3.92	14.78	3.88	14.78	3.87	14.78	3.86	14.78	3.86	14.78	3.86	-1.82
Lab 89	15.00	2.00	15.00	3.08	15.00	3.04	15.00	3.03	15.00	3.03	15.00	3.03	15.00	3.03	-1.15
Lab EX17	15.00	2.00	15.00	3.08	15.00	3.04	15.00	3.03	15.00	3.03	15.00	3.03	15.00	3.03	-1.15
Lab EX18	15.00	2.00	15.00	3.08	15.00	3.04	15.00	3.03	15.00	3.03	15.00	3.03	15.00	3.03	-1.15
Lab 28	16.00	1.00	16.00	0.57	16.00	0.55	16.00	0.55	16.00	0.55	16.00	0.55	16.00	0.55	-0.49
Lab 58	16.00	1.00	16.00	0.57	16.00	0.55	16.00	0.55	16.00	0.55	16.00	0.55	16.00	0.55	-0.49
Lab 79	16.00	1.00	16.00	0.57	16.00	0.55	16.00	0.55	16.00	0.55	16.00	0.55	16.00	0.55	-0.49
Lab 82	16.00	1.00	16.00	0.57	16.00	0.55	16.00	0.55	16.00	0.55	16.00	0.55	16.00	0.55	-0.49
Lab EX14	16.00	1.00	16.00	0.57	16.00	0.55	16.00	0.55	16.00	0.55	16.00	0.55	16.00	0.55	-0.49
Lab EX7	16.00	1.00	16.00	0.57	16.00	0.55	16.00	0.55	16.00	0.55	16.00	0.55	16.00	0.55	-0.49
Lab EX19	16.60	0.40	16.60	0.02	16.60	0.02	16.60	0.02	16.60	0.02	16.60	0.02	16.60	0.02	-0.09
Lab 21	17.00	0.00	17.00	0.06	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	0.17
Lab 23	17.00	0.00	17.00	0.06	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	0.17
Lab 39	17.00	0.00	17.00	0.06	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	0.17
Lab 7	17.00	0.00	17.00	0.06	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	0.17
Lab 72	17.00	0.00	17.00	0.06	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	0.17
Lab 74	17.00	0.00	17.00	0.06	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	0.17
Lab EX11	17.00	0.00	17.00	0.06	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	0.17
Lab G01	17.00	0.00	17.00	0.06	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	17.00	0.07	0.17
Lab 3	18.00	1.00	18.00	1.55	18.00	1.58	18.00	1.58	18.00	1.58	18.00	1.59	18.00	1.59	0.83
Lab 4	18.00	1.00	18.00	1.55	18.00	1.58	18.00	1.58	18.00	1.58	18.00	1.59	18.00	1.59	0.83
Lab 56	18.00	1.00	18.00	1.55	18.00	1.58	18.00	1.58	18.00	1.58	18.00	1.59	18.00	1.59	0.83
Lab 76	18.00	1.00	18.00	1.55	18.00	1.58	18.00	1.58	18.00	1.58	18.00	1.59	18.00	1.59	0.83
Lab 9	18.00	1.00	18.00	1.55	18.00	1.58	18.00	1.58	18.00	1.58	18.00	1.59	18.00	1.59	0.83
Lab EX5	18.00	1.00	18.00	1.55	18.00	1.58	18.00	1.58	18.00	1.58	18.00	1.59	18.00	1.59	0.83
Lab EX6	18.00	1.00	18.00	1.55	18.00	1.58	18.00	1.58	18.00	1.58	18.00	1.59	18.00	1.59	0.83
Lab EX1	19.00	2.00	19.00	5.04	19.00	5.09	19.00	5.10	19.00	5.10	19.00	5.10	19.00	5.10	1.50
Lab EX9	23.00	6.00	19.22	6.10	19.06	5.36	19.02	5.18	19.01	5.13	19.00	5.12	19.00	5.12	4.15
Lab EX10	29.00	12.00	19.22	6.10	19.06	5.36	19.02	5.18	19.01	5.13	19.00	5.12	19.00	5.12	8.13
Average	16.94		16.75	56.93	16.74	55.35	16.74	54.96	16.74	54.86	16.74	54.84	16.74	54.83	
SD	3.02		1.36	1.84	1.34	1.79	1.33	1.77	1.33	1.77	1.33	1.77	1.33	1.77	
New x*	17.0	1.00	16.75	1.36	16.74	1.34	16.74	1.33	16.74	1.33	16.74	1.33	16.74	1.33	
New s*	1.48		1.54		1.52		1.51		1.51		1.51		1.51		

N 32

Target value 16.74

Low Acceptable: 12.22

High Acceptable: 21.27

Acceptable Range: 12.22- 21.27

Flakiness Index

Iteration	0		1		2		3		4		5		6		Z Score
$\delta = 1.5 s^*$	---	xi-x*	2.22	(xi-x*) ²	2.17	(xi-x*) ²	2.01	(xi-x*) ²	1.95	(xi-x*) ²	1.92	(xi-x*) ²	1.91	(xi-x*) ²	
$x^* - \delta$	---		24.78		25.35		25.55		25.64		25.67		25.68		
$x^* + \delta$	---		29.22		29.69		29.57		29.53		29.51		29.51		
Lab EX19	19.90	7.10	24.78	7.52	25.35	4.92	25.55	4.12	25.64	3.82	25.67	3.71	25.68	3.67	-6.04
Lab EX9	24.00	3.00	24.78	7.52	25.35	4.92	25.55	4.12	25.64	3.82	25.67	3.71	25.68	3.67	-2.82
Lab EX7	25.00	2.00	25.00	6.34	25.35	4.92	25.55	4.12	25.64	3.82	25.67	3.71	25.68	3.67	-2.04
Lab EX16	26.50	0.50	26.50	1.03	26.50	1.13	26.50	1.17	26.50	1.19	26.50	1.20	26.50	1.20	-0.86
Lab EX20	26.60	0.40	26.60	0.84	26.60	0.93	26.60	0.97	26.60	0.98	26.60	0.99	26.60	0.99	-0.78
Lab 21	27.00	0.00	27.00	0.27	27.00	0.32	27.00	0.34	27.00	0.35	27.00	0.35	27.00	0.35	-0.47
Lab 3	27.00	0.00	27.00	0.27	27.00	0.32	27.00	0.34	27.00	0.35	27.00	0.35	27.00	0.35	-0.47
Lab 4	27.00	0.00	27.00	0.27	27.00	0.32	27.00	0.34	27.00	0.35	27.00	0.35	27.00	0.35	-0.47
Lab 56	27.00	0.00	27.00	0.27	27.00	0.32	27.00	0.34	27.00	0.35	27.00	0.35	27.00	0.35	-0.47
Lab 58	27.00	0.00	27.00	0.27	27.00	0.32	27.00	0.34	27.00	0.35	27.00	0.35	27.00	0.35	-0.47
Lab 7	27.00	0.00	27.00	0.27	27.00	0.32	27.00	0.34	27.00	0.35	27.00	0.35	27.00	0.35	-0.47
Lab 72	27.00	0.00	27.00	0.27	27.00	0.32	27.00	0.34	27.00	0.35	27.00	0.35	27.00	0.35	-0.47
Lab 76	27.00	0.00	27.00	0.27	27.00	0.32	27.00	0.34	27.00	0.35	27.00	0.35	27.00	0.35	-0.47
Lab 9	27.00	0.00	27.00	0.27	27.00	0.32	27.00	0.34	27.00	0.35	27.00	0.35	27.00	0.35	-0.47
Lab EX10	27.00	0.00	27.00	0.27	27.00	0.32	27.00	0.34	27.00	0.35	27.00	0.35	27.00	0.35	-0.47
Lab EX11	27.00	0.00	27.00	0.27	27.00	0.32	27.00	0.34	27.00	0.35	27.00	0.35	27.00	0.35	-0.47
Lab EX14	27.00	0.00	27.00	0.27	27.00	0.32	27.00	0.34	27.00	0.35	27.00	0.35	27.00	0.35	-0.47
Lab EX5	27.00	0.00	27.00	0.27	27.00	0.32	27.00	0.34	27.00	0.35	27.00	0.35	27.00	0.35	-0.47
Lab 23	28.00	1.00	28.00	0.23	28.00	0.19	28.00	0.17	28.00	0.17	28.00	0.16	28.00	0.16	0.32
Lab 39	28.00	1.00	28.00	0.23	28.00	0.19	28.00	0.17	28.00	0.17	28.00	0.16	28.00	0.16	0.32
Lab EX1	28.00	1.00	28.00	0.23	28.00	0.19	28.00	0.17	28.00	0.17	28.00	0.16	28.00	0.16	0.32
Lab EX18	28.00	1.00	28.00	0.23	28.00	0.19	28.00	0.17	28.00	0.17	28.00	0.16	28.00	0.16	0.32
Lab EX6	28.00	1.00	28.00	0.23	28.00	0.19	28.00	0.17	28.00	0.17	28.00	0.16	28.00	0.16	0.32
Lab 28	29.00	2.00	29.00	2.20	29.00	2.06	29.00	2.01	29.00	1.99	29.00	1.98	29.00	1.97	1.10
Lab 74	29.00	2.00	29.00	2.20	29.00	2.06	29.00	2.01	29.00	1.99	29.00	1.98	29.00	1.97	1.10
Lab 79	29.00	2.00	29.00	2.20	29.00	2.06	29.00	2.01	29.00	1.99	29.00	1.98	29.00	1.97	1.10
Lab 82	29.00	2.00	29.00	2.20	29.00	2.06	29.00	2.01	29.00	1.99	29.00	1.98	29.00	1.97	1.10
Lab EX4	29.00	2.00	29.00	2.20	29.00	2.06	29.00	2.01	29.00	1.99	29.00	1.98	29.00	1.97	1.10
Lab 89	30.00	3.00	29.22	2.92	29.22	2.76	29.22	2.69	29.22	2.67	29.22	2.66	29.22	2.66	1.89
Lab EX17	30.00	3.00	29.22	2.92	29.22	2.76	29.22	2.69	29.22	2.67	29.22	2.66	29.22	2.66	1.89
Lab EX3	30.00	3.00	29.22	2.92	29.22	2.76	29.22	2.69	29.22	2.67	29.22	2.66	29.22	2.66	1.89
Lab G01	31.00	4.00	29.22	2.92	29.22	2.76	29.22	2.69	29.22	2.67	29.22	2.66	29.22	2.66	2.67
Average	27.47		27.52	50.54	27.56	43.26	27.58	40.59	27.59	39.61	27.59	39.24	27.59	39.10	
SD	2.01		1.28	1.63	1.18	1.40	1.14	1.31	1.13	1.28	1.13	1.27	1.12	1.26	
New x*	27.00	1.00	27.52	1.28	27.56	1.18	27.58	1.14	27.59	1.13	27.59	1.13	27.59	1.12	
New s*	1.48		1.45		1.34		1.30		1.28		1.28		1.27		

N 32

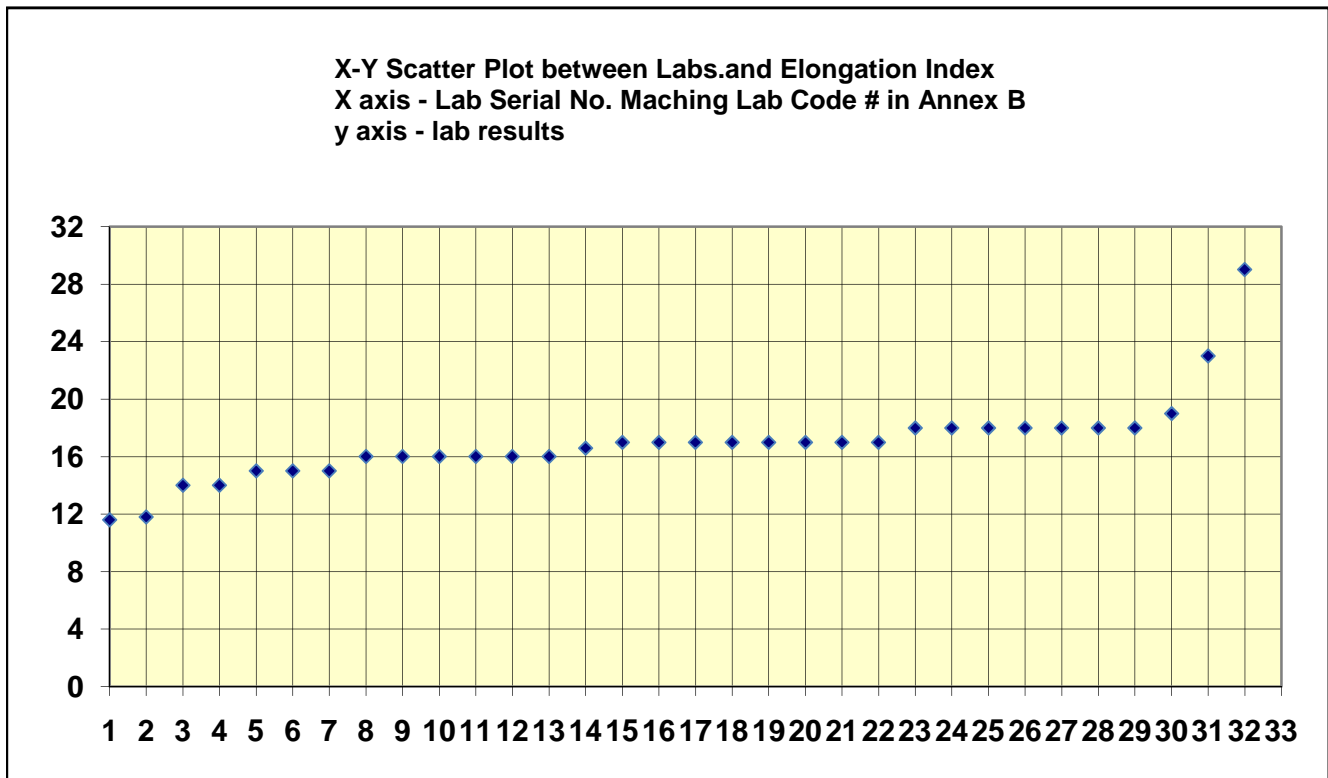
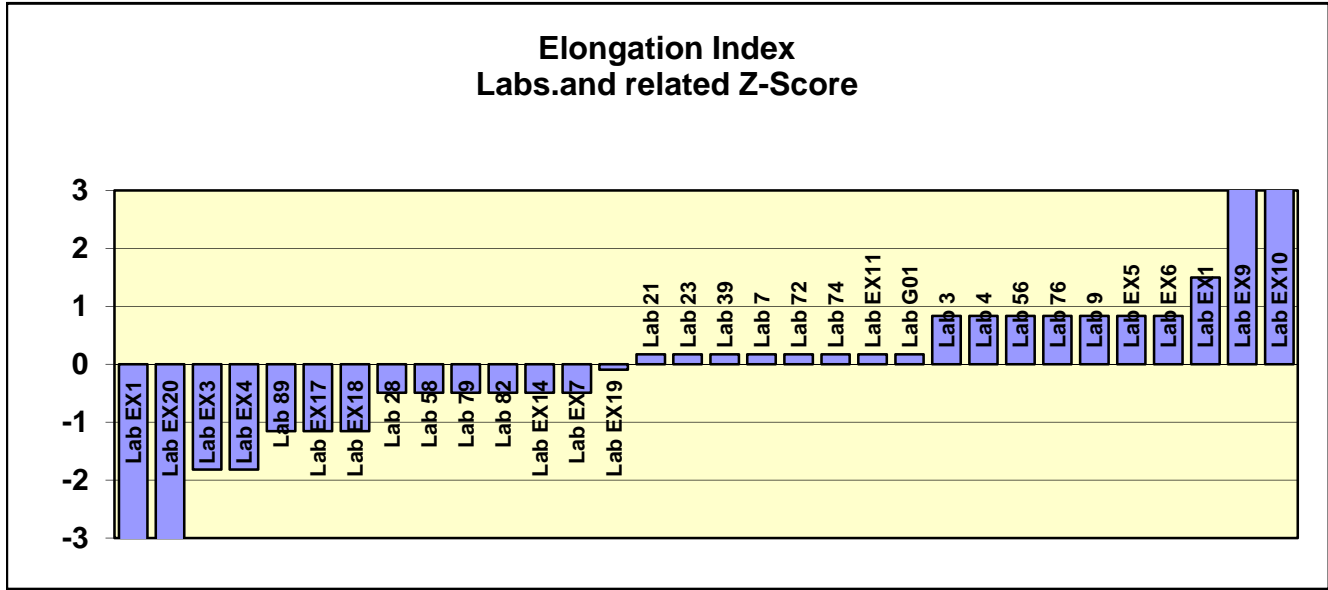
Target value: 27.59

Low Acceptable: 23.77

High Acceptable: 31.42

Acceptable Range: 23.77- 31.42

Flakiness and Elongation Index in Coarse Crushed Rocks



Flakiness and Elongation Index in Coarse Crushed Rocks

